

A THEORY ON INFORMATION AND ITS APPLICATION
TO THE EFFECT OF LABELING ON FOOD PRODUCTS¹

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Abstract

This study develops a framework which explains the welfare loss to consumers from imperfect information and provides a mechanism for analyzing the benefits from improved information. The model is applied to imperfect weight information for packaged chicken and empirical estimates of the resulting welfare loss are obtained.

It is generally understood that when a consumer purchases a product he/she has actually chosen the product for certain attributes or characteristics contained in the product (Lancaster, 1966). For instance the attributes contained in a typical food product might be taste, energy, nutrients or convenience of preparation. Choice of particular food products reflects a consumer's anticipated utility from the combination of attributes she/he perceived to exist in those products. If the consumer does not have complete information regarding the attributes of products in the choice set there exists some probability that the consumer's expenditure decisions will not be optimal and that budget misallocations will occur.

The purpose of this paper is to present a theoretical framework which explains the welfare loss to consumers from imperfect information and to provide a mechanism for analyzing the benefits from improved information. The framework of this analysis is restricted to food products and information concerning their attributes even though the theory is sufficiently general to encompass most consumer products on the market. Since the type of data available on the typical food label is either mandated by regulation, or if voluntarily provided, subject to regulatory guidelines, it is assumed for purposes of this paper that all the data provided is accurate and not misleading.

The impetus for food labeling regulation was provided by the 1969 White House Conference on Food, Health and Nutrition (White House Conference, 1970). This led to approval of the present food labeling regulations in 1973 by the U.S. Food and Drug Administration (FDA) (USHEW, 1973), which require the now familiar standardized nutritional label for all packaged food products which are nutritionally fortified or which make nutritional claims.

Consumers now have access to more complete information about the nutritional attributes of foods but studies concerning their use of nutritional data reveal an interesting dichotomy. Some research has indicated that most consumers want nutritional data and many would be willing to pay something extra on their food bill to have it (Lenahan, et.al., 1972; USHEW, 1973; USHEW, 1975; Lichtenstein, 1973; Daly, 1976; Redbook, 1976; USDA, 1977; Better Homes & Gardens, 1978). Other studies pertaining to actual usage of current label data tend to show that consumers often don't understand the data in the format presented and seldom make use of it. Lenahan, et.al. (1972) reported that only 15 percent of respondents understood the labels and only 10 percent had used them. A report issued by the FDA (USHEW, 1975) indicated one-third of consumers had used nutritional data. Redbook (1976) reported 58 percent found information about nutrition confusing. Jacoby (1977) and Jacoby, et.al. (1977) found that consumers did not use much of the available data when brand names were present and that acquisition of information decreased as the number of items shopped for increased. Scammon (1977) showed that consumers were unable to make use of nutritional data in a direct comparison of two product brands. Assam and Bucklin (1973) and Berning and Jacoby (1974) found that manufacturer's promotional statements on a label were at least as effective at influencing purchasing decisions as positive nutritional data.

Consumers with low incomes, those with low levels of education and the elderly (those most in need of dietary improvement) have been found to be the least likely to understand, acquire and use data available on food labels (USHEW, 1975; Daly, 1976; USDA, 1977). Consequently, it seems likely that economic losses from misallocation of the food budget due to misinformation fall more heavily on those least able to bear them. Some evidence, however, does seem to indicate that consumers in general are becoming more aware of nutrition and labeling in recent years. One survey found 78.5 percent had read label information in the last 10 days (Better Homes & Gardens, 1978). Another reported 66 percent had read labels during the past several months (Redbook, 1976).

The Model

The model for analyzing consumer's economic loss due to imperfect information begins with a consumer's demand curve for some food product which will be called product 'A'. This demand curve at any point in time is determined by the consumer's budget constraint, his/her marginal rate of substitution between product A and other goods and services which is, in turn, determined by the con-

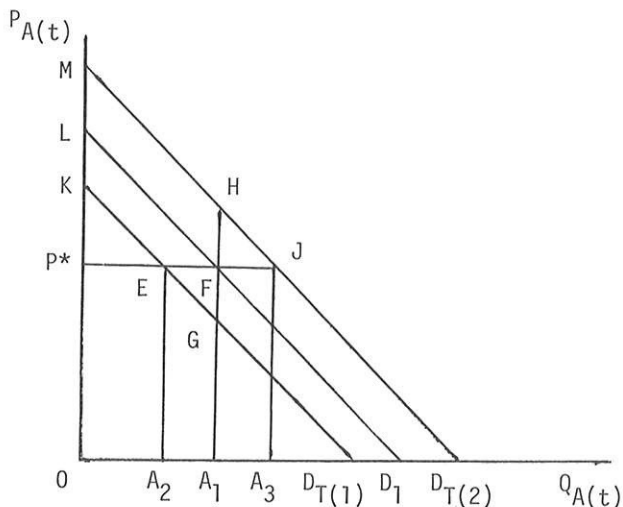
¹This paper received the Annual ACCI Public Policy Research Award in 1980.

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sumer's perception of the attributes contained in product A. Some of the attributes of the product are readily discernable simply by trying the product. For instance, the way a product tastes can be quite accurately determined in this fashion. Knowledge about other attributes such as nutritional content cannot be easily determined in this manner. Therefore, in a state of imperfect knowledge and incomplete information the consumer's existing demand curve for 'A' may be different from what it would be in a state of perfect information.³

Let D_1 (Figure 1) be the consumer's initial demand curve for 'A' in period t. Now define D_T as the consumer's true demand curve for 'A' based upon perfect information. If $D_1 \neq D_T$, the result will be a misallocation of consumer expenditures with corresponding changes in consumer's surplus and losses in welfare.

FIGURE 1.



To formulate this loss assume in the absence of perfect information that the following three possibilities exist with some probability of occurrence attached to each:

- (1) The consumer has overevaluated the true quantity and nature of attributes contained in the

³It is desirable to distinguish between data and information. Information can be defined as data which increases the knowledge of the recipient. Data is therefore potential information which must be processed by the recipient before it becomes information. The concern here is with food product data which is produced either voluntarily or through regulation by the food processor. Information is produced by the consumer through a household production function of the type developed by Becker (1973) with the inputs being new data, prior information stored in memory and time. The mere existence of data on a food label will do nothing unless the consumer processes it into information.

product and $D_1 > D_T(1)$ where $D_T(1)$ is the demand curve which would occur with perfect information if this situation holds.

- (2) The consumer has undervalued the true quantity and nature of attributes contained in the product and $D_1 < D_T(2)$, where $D_T(2)$ is the demand curve which would occur with perfect information if this situation occurs.
- (3) The consumer has correctly evaluated the attributes of the product and the current demand curve, in this case D_1 , is equal to the demand curve, D_T , which would occur with perfect information.

Letting X_1, X_2, X_3 stand respectively for the probabilities of (1), (2) and (3) occurring, it can be said that $X_1 + X_2 + X_3 = 1$. Note that only one of $D_T(1), D_T(2)$ or $D_1 = D_T$ actually exist at any point in time as the demand curve which would be attained with perfect information.⁴

The consumer incurs a loss in terms of welfare if either situation (1) or (2) occur. There is, of course, no loss if (3) occurs.

Assuming a constant market price (P^*) for 'A', the welfare loss if (1) or (2) occurs can be determined (Peltzman, 1973). If (1) occurs it becomes clear that the consumer has purchased too much of 'A'. He/she has purchased A_1 units in period t but actually should have purchased only A_2 units. For the additional units beyond A_2 which the consumer purchased ($A_1 - A_2$) he/she paid an amount equal to $A_2 EF A_1$, but the actual value of these units to him/her as now revealed by $D_T(1)$ is only $A_2 EGA_1$. Therefore the consumer has incurred a welfare loss in period t on these units of $A_2 EFA_1 - A_2 EGA_1 = GEF$. If (2) occurs then the consumer has purchased too little of 'A'; he/she should have purchased A_3 rather than A_1 units. The consumer's surplus in period t would have been P^*MJ had he/she purchased A_3 units, but since only A_1 units were purchased the surplus on the remaining units, ($A_3 - A_1$), is lost. This surplus loss is represented by the area FHJ . FHJ represents the loss from under-allocation of funds to 'A'. GEF represents the loss from funds misallocated to 'A' which should have been allocated to some other product. Multiplying the loss to the consumer if situations (1) or (2) occur by the probability of their occurrence enables one to formulate an equation for expected loss (EL) to the consumer in period t from imperfect information:

$$EL(T) = X_1 [1/2(EF)(FG)] + X_2 [1/2(HF)(FJ)] \quad (1)$$

Letting the respective demand curves be written as follows: $D_1: Q_A = f^0(P); D_T(1): Q_A = f^1(P);$

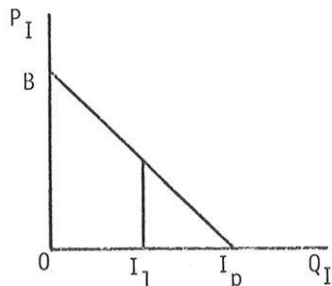
⁴The model is conceptually simplified by disallowing the elasticities of demand to change as the demand shifts left or right. A parallel shift in D_1 is not theoretically necessary nor is it necessarily realistic.

$D_T(2): Q_A = f^2(P)$ the expected loss can be formulated as follows:

$$EL(t) = X_1 \left[\int_0^{A_2} f^1(P) dp + (A_1 - A_2) P^* \right] - \int_0^{A_1} f^1(P) dp \\ + X_2 \left[\int_0^{A_3} f^2(P) dp - \int_0^{A_1} f^2(P) dp - ((A_3 - A_1) P^*) \right] \quad (2)$$

Equation 2 shows that the consumer can expect to incur some dollar loss from misallocation of expenditures on good 'A'. The consumer, therefore, has incentives to obtain information which would reduce this EL, and he/she should be willing to pay for information an amount equal to the reduction in EL which would be generated. A consumer demand curve for additional information about product 'A' can thus be formulated based upon this willingness to pay. Let BI_p (Figure II) be the consumer's demand curve for additional information (I) about 'A'. The point where the demand curve intersects the horizontal axis, I_p , is significant because it corresponds to the level of information needed to obtain perfect information about 'A'. To see this, note that any new information the consumer obtains about 'A' can be expected to reduce EL from misallocation.

FIGURE II.



The larger the level of information obtained, the smaller becomes EL and the less becomes the willingness to pay for additional information. It follows directly that the consumer's willingness to pay for the last bit of data that will give "perfect" information goes to zero since the loss from misallocation has also gone towards zero. At this point $\partial Q_A / \partial I_A = 0$. Further information will not affect the quantity of 'A' purchased.

The demand curve for information about 'A' can be stated as:⁵

$$P_I = f(Q_I) \quad (3)$$

where P_I is the price of information or willingness to pay for information about 'A' and Q_I is the quantity of information obtained about 'A'. The demand curve BI_p (Figure II) is based on the consumer's willingness to pay for information to

⁵This formulation is chosen because quantity of information is usually provided exogenously by regulation. The quantity provided thus determines willingness to pay.

reduce EL. Since $EL = 0$ with perfect information it must be true that

$$EL = \int_0^{I_p} f(Q_I) dQ_I \quad (4)$$

The expected loss is equal to the area under the information demand curve. This means that the demand for information will be greater for those products which have a greater EL.

Given the information demand curve, BI_p , assume that through government regulation or voluntary initiative some quantity of nutritional data is provided exogenously on the label of 'A'.

Further assume the consumer obtains OI_1 in additional useful information from the data. The consumer's willingness to pay for this data is

$$\int_0^{OI_1} f(Q_I) dQ_I \quad (5)$$

The demand for information is determined by EL, and the consumer is willing to pay a price for this data equal to the reduction in EL that will be generated by the data. By subtracting (5) from the formulation for EL, (2 or 4) one obtains a new EL, EL' , which will exist after evaluation of the new information. Therefore,

$$(2) - (5) = EL' \quad (6)$$

Upon evaluating the information the consumer will decide one of three things:

- (1) He/she has been overevaluating the product and $D_1 > D_T$.
- (2) He/she has been underevaluating the product and $D_1 < D_T$.
- (3) He/she has been correctly evaluating the product and $D_1 = D_T$.

For simplicity assume that all product information can be classified as positive or negative. The receipt of positive information will shift out the existing demand curve whereas negative information will decrease demand. As long as $OI_1 < OI_p$ the consumer still has incomplete information.⁶ The missing information, $OI_p - OI_1$, could have an opposite influence on demand than the information initially obtained in OI_1 . For example the initial receipt of positive information would shift demand out to some $D_0 > D_1$. The remaining information could be negative to the extent that the perfect information demand curve would be $D_T(1)$, where $D_T(1) < D_1$. This means that the initial receipt of information actually led to a worse purchasing decision on the part of the consumer. This may be quite common in situations where advertising results in positive data being provided and negative data being discovered only after purchasing the product. The opposite case could also occur in which negative data is released, for example in the form of a required warning label,

and positive data discovered at a later date. Clearly more information need not result in better purchasing decisions by consumers. It could result in worse decisions, a phenomenon that has been observed by Jacoby (1977).

The area of loss will not necessarily be decreased by partial information, yet, if information is to be demanded it must be true that EL will decrease. This implies that some change in the distribution of loss probabilities must occur. After having processed OI_1 in information a new demand curve for A will exist based upon the consumer's evaluation of the information. This new demand curve, call it D_0 , is based upon more information than the old demand curve, D_1 , was. (Recall that X_3 is the probability that the existing demand curve is correct.) It can be expected that X_3 is a function of the level of information obtained and that $\partial X_3 / \partial I > 0$. Additional information will then decrease EL through an increase in X_3 which results in a decrease in X_1 and/or X_2 . If upon evaluating the information the consumer decides $D_1 = D_T$, there will be no change in demand since D_1 is still believed correct but since this opinion is now based upon more information the probability that the opinion is correct has increased. EL will therefore decrease.

Determination Of An Optimum Amount Of Information Provision

There are two types of costs involved in providing information. Producers incur a cost in providing the data on the label and consumers incur a cost in processing the data into useful information. Cost to producers for providing data includes some fixed component plus some variable component which is a function of output (Wall Street Journal, 1973; Albrecht, 1975; General Foods, 1975). The fixed component of cost occurs due to expenses incurred in initially obtaining the data and in preparing the label. The variable component occurs due to the need for inspections and monitoring the production process to ensure minimum deviations from the label specifications. Also it is often argued that per unit production costs are higher due to input rigidity imposed by labeling. In other words manufacturers are unable to alter their ingredient mix in response to price signals if doing so would change the label specifications.

The cost to consumers is an implicit cost of time. The more data a consumer processes into information the greater will be the cost in time. This cost can be written as follows:

$$C_c = \gamma^T \quad (7)$$

where C_c is the cost to consumers for processing information, γ is a measure of the opportunity cost of time and T is the time required to process data into information. T can be formulated as follows:

$$T = \lambda Q_I \quad (8)$$

where λ is the time required to process a unit of

information and Q_I is the quantity of information processed. Substituting into (7) yields

$$C_c = \gamma(\lambda Q_I) \quad (9)$$

The benefit to consumers from processing information is the reduction in expected loss (EL) from expenditure misallocation. The more information a consumer processes the less will be EL. The change in the demand for information with respect to quantity of information obtained measures the reduction in EL from obtaining further information. The marginal benefit from additional information is

$$|MB| = \frac{\partial EL}{\partial Q_I} < 0 \quad (10)$$

The value attained by (10) measures the marginal benefit to the consumer for processing information considering the present time period only.⁶ Assuming these benefits are obtained independently by consumers, the total benefit in one time period to all consumers is obtained by the summation of the individual MB's over all consumers of the product.

$$\text{Total MB} = \sum_{i=1}^N MB_i \quad (11)$$

where N is the total number of consumers of the product.

Since the expected reduction in EL from specific types of product data measures the willingness to pay for data, an empirical specification of the marginal benefit expression is obtainable by asking consumers how much they would be willing to pay for some additional specific information disclosure. Responses would serve as a proxy for the expected reduction in EL or the expected marginal benefit of obtaining the information.

The optimum level of information for consumers to process on any product occurs where the marginal benefit of processing (the reduction in EL) is equal to the marginal cost of processing whereby (10) the marginal benefit has been shown to decrease as additional information is obtained. The marginal cost function as formulated is constant. Considering the present time period only, the optimum level of information to process on product A from the i^{th} consumer's viewpoint occurs where

$$MB_i = MC_i = \partial C_{c_i} / \partial Q_I = \gamma\lambda \quad (12)$$

where MC_i is the marginal cost of processing the

⁶ Although it would be desirable to express MB directly in terms of the change in (2), quantity of information (Q_I) does not appear as an argument in (2). However, an explicit development of the MB expression can still be obtained by measuring the change in (4) with respect to a change in Q_I , i.e. $MB = |\partial [f(Q_I) dQ_I] / \partial Q_I|$.

last unit of information for the i^{th} consumer and which can be interpreted through $\gamma\lambda$ as being equivalent to the wage rate multiplied by the unit processing time.

Since it is likely that any reductions in loss from information processing would reduce EL in future time periods, it is proper to measure the present value of these future benefits to obtain the true benefits of processing information. This can be expressed as follows:

$$PVMB_i = \sum_{j=t}^M \frac{MB_{ij}}{(1+r)^j} \quad (13)$$

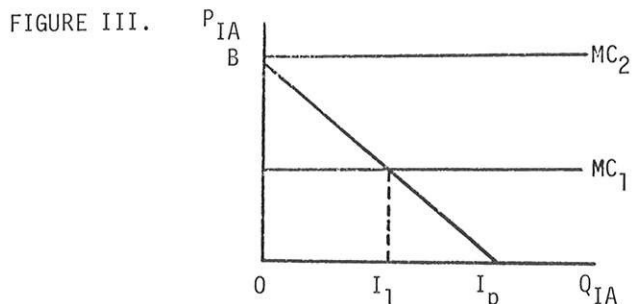
where $PVMB_i$ is the discounted benefit stream from processing information to the i^{th} consumer over time periods $j = t, 2, 3, \dots, M$. M is the remaining life span of the consumer over which the acquired information is expected to be valid, and r is an appropriate discount rate. The total discounted benefit to all consumers of the product, total $PVMB$, then becomes

$$\text{Total } PVMB = \sum_{i=1}^N PVMB_i \quad (14)$$

This derivation is analogous to that indicated by Nelson (1970) in his discussion of information search.

Turning briefly to the question of the level of voluntary data provision by producers, it is clear that whether producers will voluntarily provide nutritional data depends upon how that data will be perceived by consumers. Negative data will convince consumers that they have been overevaluating the product which will lead to a decrease in demand as well as higher costs due to labeling for the producer. It would not be expected that producers would voluntarily provide data unless it was expected that evaluation of the data would lead to increased demand by consumers enabling the producer to increase price and/or sales. Certain indirect effects due to disclosure, such as increased consumer confidence, have been indicated by Daly (1976) and the FDA (USHEW, 1975). These effects could also alter the demand for affected products.

This model can be used to analyze the response of consumers to nutritional and other information as indicated in the studies cited earlier. In terms of the model the high desire indicated for product label data and other information is an expression of the demand curve for information (Figure II). The low actual usage of the data provided can be explained by the costs consumers incur in processing the data into information. It would be expected that those with low incomes, poor education and the elderly would incur much higher costs of processing information in terms of λ (time required to process) than other consumers, although this may be offset somewhat by a lower γ (opportunity cost of time). In extreme cases λ would be very large for those who were not literate in English, visually handicapped or unfamiliar with nutrition and nutritional jargon. Figure III



illustrates this situation. A consumer with a marginal cost of processing information of MC_2 would not process any information if BI_p was his/her information demand curve. If the costs were lower, say MC_1 , the consumer would process and use some positive amount, OI_1 , of information. FDA, FTC, and USDA jointly held hearings in 1978 to ascertain the effectiveness of existing labeling regulations and to determine consumers' perceptions of possible changes (USHEW, 1978₁). A preliminary summary on these hearings (USHEW, 1978₂) reported senior citizens, "individuals of low comprehension," non-English speaking people and children were very much in favor of proposals to present the label data in graphics form. In terms of the model this can be seen quite simply as an appeal by these people to lower the cost of processing information. Another conclusion from the hearings was that those with special dietary needs were most willing to incur extra costs to obtain information. This would be expected since these individuals would have a higher EL and consequently a higher demand for information.

An Application To Labeled Weight

The model and theory developed in this paper are meant to be generally applicable to all types of information and data pertaining to food products. The type of data most frequently discussed thus far is nutritional data, but unfortunately at the present time the author is not aware of any nutritional data that would enable a direct application of the model. A type of product information that can be analyzed, however, is labeled weight. Some foods, specifically meats and poultry, tend to accumulate moisture in the packing process. If the weight of this moisture is included in the weight of the product appearing on the package label, the label weight will tend to overstate the true amount of product contained in the package.

Proposed federal regulations (USDA, 1979) will require that on average the drained weight of the product (the product minus accumulated moisture--essentially the amount of pure product) be equal to or greater than the label weight. However, for any particular package, depending on the amount of moisture accumulation, the label weight may be greater or less than the drained weight. Most states allow a "dry tare" approach to be used in determining label weight. With this method the label weight is determined by subtracting the weight of the packaging material (the dry tare) from the weight of the total package, and this results in the moisture being included in the label

weight. A few states (California, Washington, and Michigan in particular) require that the label weight be based on the drained weight of the product. In either case the actual drained weight of the product in a package may be more or less than the weight specified on the label. Thus the consumer of any given package may receive more or less of the pure product than he/she had anticipated based on the labeled weight. This is a problem of imperfect information quite suited to analysis within the model developed earlier in this paper (Figure 1).

The data analyzed consisted of 406 packages of chicken sampled by USDA researchers at retail outlets across the nation. Researchers obtained the label weight for each package, drained the moisture from each one and reweighed it enabling them to measure the amount of moisture accumulation in each package. The data were collected by USDA (Handy, et.al., 1979) in several states including some states which require drained weight labeling and some which allow dry tare labeling. Labeled weight (W_L), drained weight (W_D) and price per labeled pound (P^*) were obtained for each of the 406 packages. With this data it was possible to make an estimation of loss due to imperfect weight information and to derive an approximate benefit to consumers from improved weight information.

For convenience it was assumed that the consumer had perfect information about all of the product's attributes except weight. The losses to be estimated then are analogous to the areas GEF and FHJ from Figure 1.

When $W_D > W_L$ the consumer will be underevaluating the product. Since there is more of the product and its attributes than he/she has been led to believe from W_L , the true demand curve, D_T , lies to the right of the original demand curve, D_1 . To estimate the loss from underevaluation, HF and FJ must be found. To find HF consider that the package contains more product than is indicated on the label. If this was known the consumer would be willing to pay more per labeled lb. for the package. This additional willingness to pay is HF and is found as follows:⁷

$$HF = \frac{P^*W_S}{2W_L} \left(2 - \frac{W_S}{\epsilon W_L} \right) \quad (15)$$

⁷The details involved in obtaining (15) are as follows: It is necessary to find willingness to pay (w.t.p.) for W_S . Assume a w.t.p. of P^* per unit for quantities up to W_L . For quantities beyond W_L there will be some decrease in w.t.p. Find this by solving the elasticity formula, $\epsilon = \frac{\Delta Q}{\Delta P} \frac{P}{Q}$, for ΔP and substitute in

W_S for ΔQ , W_L for Q and P^* for P . This yields $\Delta P = W_S P^* / \epsilon W_L$. $P^* - \Delta P =$ w.t.p. per unit for W_D . W.t.p. for W_S is found by averaging the w.t.p. per unit for W_L and W_D and multiplying by W_S . Doing that one obtains the following: $[P^* + (P^* - W_S P^* / \epsilon W_L)] W_S / 2$. Factoring out P^* and dividing by W_L to get w.t.p. per labeled lb. yields (15).

where $W_S = W_D - W_L$ and ϵ is the price elasticity of the demand curve. The elasticities used in this study are the national market price elasticities of consumer demand for chicken estimated by Brandow (1961) and George and King (1971).

To find FJ consider that $(P^*W_L/W_D) - P^*$ results in an effective decrease in price per labeled lb. when $W_D > W_L$. The additional amount of product the consumer would purchase given this effective price decrease is FJ and is found as follows:⁸

$$FJ = \epsilon W_L (W_L/W_D - 1) \quad (16)$$

To estimate the area of FHJ the triangle area formula is employed to obtain:

$$L_{FHJ} = 1/2 HF(FJ) \quad (17)$$

where L_{FHJ} is the loss from underevaluation which is calculated for each individual package of chicken in this study for which $W_D > W_L$.

When $W_D < W_L$ the consumer will be overevaluating the product; the true demand curve lies to the left of the original demand curve, D_1 . Based on the labeled weight he/she will think the product contains more than it actually does. The loss from overevaluation is depicted as GEF in Figure 1. The method employed to estimate this loss is completely analogous to the technique outlined for estimating FHJ and hence is not delineated here. Let it suffice to say that had the consumer known the weight deficiency, he/she would have been willing to pay less per labeled pound for the product enabling FG to be obtained. Also the weight deficiency results in an effective price increase which leads to a decrease in purchases enabling one to obtain EF. The loss from overevaluation is therefore:

$$L_{GEF} = 1/2 EF(FG) \quad (18)$$

where L_{GEF} is the loss from overevaluation.

In this instance the equation to estimate a loss from overevaluation, L_{GEF} , is the same as that used to estimate a loss from underevaluation, L_{FHJ} , so a single equation can be employed to estimate the losses from imperfect weight information. The equation obtained through combining and simplifying the expressions outlined in (15) and (16) is

$$L = \frac{P^*W_S}{4} \left(\frac{W_L}{W_D} - 1 \right) \left(2\epsilon - \frac{W_S}{W_L} \right) \quad (19)$$

⁸The details involved in obtaining (16) are as follows: Solving the price elasticity formula for ΔQ , where ΔQ is the change in pounds purchased yields $\Delta Q = \epsilon PQ/P$. Substitute $P^*W_L/W_D - P^*$ for ΔP , W for Q and P^* for P to obtain $FJ = \Delta Q = \epsilon (P^*W_L/W_D - P^*) W_L/P^*$. Factor out P^* and cancel to obtain (16).

TABLE 1. Estimated Loss Due to Inaccurate Weight Labels

Run	(1) Sample Size (n)	(2) Numbers Of Cases Where $W_D > W_L^a$	(3) Numbers Of Cases Where $W_D < W_L^a$	(4) Loss to Consumers (L)	(5) Total Ex- penditure From Sample $TE = P \cdot W_L$	(6) Loss As A Proportion Of Expenditure $LPE = L/TE$
Full sample $\epsilon = -1.16$ (Brandow)	406	198	203	\$0.3872	\$1,058.21	.0003659
Full sample $\epsilon = -.78$ (Geo. & King)	406	198	203	0.2649	1,058.21	.0002503
Nondrained weight states $\epsilon = -1.16$	123	7	114	0.1147	336.32	.0003410
Nondrained weight states $\epsilon = -.78$	123	7	114	0.0776	336.32	.0002307
Drained weight states $\epsilon = -1.16$	283	191	89	0.2725	721.89	.0003774
Drained weight states $\epsilon = -1.16^b$	281	191	87	0.1096	715.97	.0001530
Drained weight states $\epsilon = -.78$	283	191	89	0.1873	721.89	.0002594
Drained weight states $\epsilon = -.78^b$	281	191	87	0.0737	715.97	.0001029

^aThe observations in columns 2 and 3 may not total the sample size (column 1) since in a few cases $W_L = W_D$.

^bInfluential cases dropped.

The loss was estimated with six different combinations of the sample and elasticities. The results are summarized in Table 1. Results were obtained for the entire sample using (a) Brandow's (1961) elasticity estimate ($\epsilon = -1.16$) and (b) George and King's (1979) estimate ($\epsilon = -.78$). Results were also obtained by dividing the sample into two parts, data from states which have drained weight labeling regulations and data from those states which do not have such regulations. These subsamples were each analyzed separately using both elasticity estimates. Two observations from the drained weight states subsample exhibited $W_L > W_D$ by a substantial amount. This tended to distort the analysis in the drained weight states, so losses for these states were obtained both with and without these two outlying observations.⁹

⁹There is no evidence to indicate whether these observations occurred due to sampling error or

The first three columns of the table are self-explanatory. Column 4 (loss to consumers) is the result obtained from applying equation (19) to each observation and summing over all the included observations. Column 5 (total expenditure) is simply the amount consumers would have had to pay at retail for the sum of the observations included in the particular run. And column 6 (loss as a proportion of expenditure) is obtained by dividing the loss from each run by the total expenditure (column 5) for that run. For the full sample ($\epsilon = -1.16$) consumers would have misallocated \$.39 on the purchase of 406 packages

due to mislabeling. Sampling error would, of course, make the observations invalid. However, if they occurred due to mislabeling they would represent legitimate losses to consumers in which case they should remain in the sample.

of chicken. The proportion of the expenditure misallocation for the packages in the sample was .00037. This proportion varied little between drained and nondrained weight states where outlying observations were not dropped. The loss as a proportion of expenditure (LPE) was only half as much (.00015) in drained weight states when the outlying observations were dropped.

Caution needs to be exercised in interpreting the results of the application due to the small size of the data set and some rather strong assumptions necessary to fit this particular data set to the model. At first glance the actual losses to consumers seem quite small, but considering the total amount U.S. consumers spend on chicken in particular and other meats and poultry in general, these types of losses can be significant. For instance per capita chicken consumption in the U.S. in 1978 was 47.7 lbs.; the average price was \$0.66/lb. meaning that on average U.S. consumers spent about \$31.72 per capita on chicken in 1978. Taking the liberty of projecting the results from this sample to these 1978 consumption figures, a crude estimate of the annual loss from imperfect weight information on chicken can be obtained. Multiplying the per capita expenditure figures by the approximate U.S. population and then multiplying by the (LPE) figures from column 6 of Table 1 gives a loss to consumers of about \$2,550,000 when LPE = .0003659 (full sample using $\epsilon = -1.16$). The loss is about \$1,740,000 when .0002503 is used as LPE (full sample using $\epsilon = -.78$).

These figures also represent the benefit to consumers from improved weight information. Figures of this sort have obvious significance in terms of cost-benefit measurement for programs designed to improve label information to consumers. The simple average of the two estimated loss figures is \$2,145,000. This potential consumer benefit could be compared with costs incurred by sellers in providing new data and by consumers in processing it to determine if there are net benefits or net costs generated by requiring additional information. In this particular example processing costs to consumers are probably zero since there would be no new information on the label, only a more accurate representation of the product weight. Assuming the loss figure of \$2,145,000 is somewhat valid, if processors could provide improved weight information of the type discussed here at an annual cost of less than \$2,145,000, it can be concluded that it would be beneficial to have them do so.

In addition, it may be possible for all states to require a drained weight labeling system. Taking the average of the LPE's obtained from the drained weight states with the two influential observations dropped (rows 6 and 8 of Table 1) and multiplying by total national expenditures gives an approximate annual loss of \$890,000. If such a system was imposed nationwide the reduction in loss would be \$2,145,000 - \$890,000 = \$1,255,000. If a drained weight labeling system for chicken could be imposed nationwide at an annual cost of less than \$1,255,000 it would be socially beneficial to do so.

The results also indicate that overevaluation seems less likely to occur in states which impose drained weight labeling regulations (note column 3 from Table 1) and when the influential observations are removed LPE becomes considerably less in these states also. To test for significance of differences between the two subsamples, the absolute values of the W_S ($W_S = W_D - W_L$) were summed for each subsample. The mean value for $|W_S|$ was .0569 lbs. for the nondrained weight states and .0431 lbs. for the drained weight states. A t test for significant differences between sample deviation proportions produced a $t = 2.86$, significant at a .01 level of confidence indicating that the mean deviation between W_D and W_L was significantly less in states which had a drained weight labeling system.

It should also be noted that losses were greater when the larger elasticity coefficient was used. This result will be true in general since differentiating the loss equation (19) with respect to ϵ gives the value of

$$\frac{\partial L}{\partial \epsilon} = - \frac{W_S P^*}{2} \left(\frac{W_L}{W_D} - 1 \right) \quad (20)$$

which will always be positive for $W_D \neq 0$ and $W_L \neq W_D$.¹⁰

Finally it should be noted that the procedure used to obtain these results necessarily represents some departure from the model's basic theory. Loss from imperfect information is unique to each consumer based upon his/her demand for the product, existing information at each consumer's disposal, etc. The only theoretically correct way to measure this loss is with the individual consumer as was done in the model where individual demand curves led to obtaining an EL for the individual which led to obtaining the MB of information for the individual. Aggregation was done only in the final step where the individual MB's were summed to obtain an aggregate benefit figure from information. In this application it was necessary to begin with an aggregate demand curve and assume its applicability to the individual consumer. The loss figures from the individual packages were then summed to obtain the total loss (L). The difference is that aggregation was utilized at the beginning in the application rather than at the end as the model mandates.

Summary and Recommendations

It was shown that in the absence of perfect information about a product the consumer incurs a welfare loss in dollar terms from expenditure misallocation. This loss leads to a demand for information by consumers who would rationally be

¹⁰The minus sign at the front of the expression is due to assuming a negative coefficient for ϵ .

willing to pay for information an amount equal to the reduction in their loss that would be generated. Finally it was shown that both producers and consumers incur costs in providing data and information respectively. These costs place limitations on the amount of data voluntarily provided and the amount of information processed.

The model was then applied to a specific case of imperfect information. Data indicated that the labeled weight for packages of chicken could be either greater or less than the actual drained weight of the product. Consumers would incur a loss in either case which was estimated to be between 0.037 and 0.01 percent of expenditure for chicken.

In terms of policy any programs designed to increase consumers' literacy concerning data available on labels or to present the data in a more easily processible format should lead to more processing of information which will reduce loss due to misallocation of the budget. However, it was shown that policies designed to simply put more and more data before consumers are not necessarily advisable. The costs to producers in generating the data and to consumers in processing it should be considered in light of the benefits society can expect to gain.

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THE ASSESSMENT OF THE CONSUMER AWARENESS OF ADULTS¹

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Abstract

An instrument was developed to measure the adult awareness of sources of consumer information, consumer protection laws, and channels of recourse. The process included the computation of two reliability coefficients and the assessment of content and construct validity. Low total scores on the test were predominant. The findings support the assumption that consumer education for adults is necessary.

Current conditions including inflation, the complexity of consumer products and a climate favoring deregulation underscore the need for consumer competency. Consumer competency assumes that consumers have a knowledge base to implement in the marketplace: awareness of appropriate product and service information, consumer protection laws and regulations, and channels of recourse. Do consumers have this awareness?

Many consumer study researchers conclude that an optimum level of consumer awareness does not exist. They recommend consumer education as a means of increasing consumer awareness. A valid and reliable measurement tool is needed in order to assess levels of consumer awareness. Typical existing tests measure the ability of respondents to select appropriate sources of information, laws, and channels of recourse from preconstructed lists. It seems fair to assume that this type of test fails to measure probable responses to important consumer problems in actual situations.

The problem addressed in this research was the development of an assessment instrument which would reflect respondents ability to recall and apply appropriate consumer product/service information, consumer protection laws and regulations, and channels of recourse.

The process of test development included:

- determining the test format and content to be included,
- writing test questions to reflect the content,
- pilot testing the instrument to assess its usability,
- assessing the content validity of the instrument,
- estimating the reliability of the instrument and,
- making an initial assessment of the construct validity of the instrument by developing and testing hypotheses in order to identify factors which are related to significant differences in test scores.

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The Need for Consumer Awareness

Many consumer advocates, educators, and researchers have written about the need for consumers to be informed. An informed consumer is characterized as being: (1) aware of available product or service information; (2) aware of statutes, regulations, and standards that provide protection from deceptive or unscrupulous business practices and from unsafe or misrepresented products; and (3) aware of agencies that assist consumers by processing grievances and attempting to gain redress (Caplovitz, 1963; Day & Brandt, 1974; Ross, 1974; Swagler, 1979). All three aspects of awareness are critical to making sound choices that lower the risk of dissatisfaction.

Awareness of Information. Several authors and researchers indicate that when consumers do not search out and use available information before making purchase decisions, they increase the probability that they will be dissatisfied with the product they have purchased (Sproles, Geistfield, & Badenhop, 1978; Swagler, 1979). However, different consumers look for and use different amounts and different types of information. Thorelli, Becker, and Engledow (1975) identified three typical groups of consumers: Information Seekers (IS), Average Consumers (AC), and Underprivileged Consumers (UC). The researchers indicated that AC think of themselves as well informed consumers. They usually do not engage in a prepurchase search for information and therefore are likely to face greater risk of post purchase dissatisfaction.

In general, studies indicate that consumers vary greatly in their approaches to gathering and using information. Each individual has different perceived needs, wants, and risks (Thorelli & Thorell, 1977). Each individual also carries a different amount of residual information from previous experiences, and that is a determining factor in the amount of information needed (Swagler, 1979).

Awareness of Consumer Protection Regulations. Not only do consumers need to be aware of product and service information before making a purchase decision, they need to know about statutes, regulations, and standards that protect them in the marketplace. Caplovitz (1963) studied consumers appearing in court in New York City for non-payment of bills. Thirty-five percent of the defaulting debtors interviewed gave reasons for non-payment which implicated the creditor. Confronted with what they perceived to be an injustice, these consumers simply refused to make payments which they did not believe were justified. The researchers concluded that failure to take alternative action was due to lack of knowledge of consumer protection laws.

Awareness of Channels of Recourse. A third awareness need of individuals is to know where to go for assistance in obtaining redress for perceived consumer dissatisfaction. When consumers are less than careful, or when they experience dissatisfaction in spite of using precautionary procedures, they need to know what steps to take and/or what agencies can help them achieve at least partial redress. The findings from two studies indicate that consumers view the vendor (store or manufacturer) as the primary avenue for redress (Baxley, 1975; Haefner & Leckenby, 1975). It is not clear from the literature whether or not consumers who complain first to the vendor and do not achieve satisfaction then direct their complaint to other channels of recourse--such as business and trade associations, federal regulatory agencies, private consumer organizations, media-sponsored consumer action services, or legal institutions. Changing Times Magazine (December, 1977) reported that consumers approach consumer complaint agencies as a last resort after attempting to resolve the problem themselves. There was no empirical basis for the statement. Several researchers indicate that some consumers are unaware that consumer complaint agencies exist or that governmental agencies such as the CPSC, the FDA, and the FTC handle consumer complaints (Baxley, 1975; Capiovitz, 1963; Haefner & Leckenby, 1975; Warland, Herrmann, & Willits, 1975).

The Need for Consumer Education. Many authors and researchers identify the need for adult consumer education programs. Thorelli (1971) stated that motivation, receptivity, and informed consumership depend on consumer education, and Brown and Dimsdale (1973) argued that the best way to help and protect consumers is through consumer education.

In advocating consumer education for adults, Ralph Nader (1975) proposed that such education utilize common, real-life consumer situations for classroom analysis and field experience. His assumption was that by engaging in simulations, individuals would have the opportunity to practice making intelligent judgements. He suggested that practicing would enable consumers to make the acquired competencies part of their normal reactions to the consumer process.

Nader's proposal can be carried beyond instruction and applied to competency testing of participants in consumer education programs. If the instrument used to measure consumer competency also simulates actual consumer situations, it is posited that the instrument will provide a more valid assessment (Krathwohl & Payne, 1971).

In the studies where the different components of consumer awareness were researched, there were common socio-economic characteristics among those consumers identified as being informed, aware of their rights, or cognizant of existing channels of recourse. Generally these consumers were well educated; had above average incomes; were employed in, or married to spouses in professional or managerial positions; and were between the ages of 35 and 50. Conversely, low awareness was not related to consumers evidencing any one set of character-

istics, but was prevalent among all socio-economic groups.

The Assessment of Consumer Awareness

Pre-assessment of learning is often recommended as a first step in instruction. Instruction to increase consumer awareness, whether in the classroom or in an informal group learning situation, is no exception (Brown & Dimsdale, 1973). The identification of awareness deficiencies is part of a sound basis for planning and developing programs and/or curricula to enable participants to raise their levels of consumer awareness. Thus a primary need, then, is for an instrument to assess the three facets of consumer awareness (Haggett, 1975).

A number of instruments have been developed to measure specific facets of awareness or to measure consumer competencies of specific population segments. They can be divided into two major classifications by intended use: (A) achievement tests designed to assess knowledge gained by exposure to a class in consumer education; and (B) instruments designed to gather data for application to either a single component of the construct consumer awareness, or measure a broad range of consumer concepts--too broad to fit the construct as it has been operationally defined for this study.

The achievement tests reviewed by the researcher were in multiple choice format--a format which requires that, for each question, the respondent merely recognize the correct response from a group of responses. No tests required the respondent to construct responses based on previous experience or knowledge. Since individuals experiencing problems during the consumer transaction process are not automatically provided with a list of possible solutions to the problem, the multiple-response test form was rejected as an appropriate approach for assessing consumer awareness (Oliver & Shaver, 1979). The consumer must operate on the basis of previous experience and knowledge and, within the framework of a stressful situation, recall and apply the most useful information. Therefore, the development of a short response test which would attempt to simulate actual consumer situations was indicated. The objective of this research was, then, to develop an instrument to assess the consumer awareness of adults and to make estimates of the reliability and validity of the instrument. It would be known as the Test of Consumer Awareness for Adults (TCAA).

Test Development

Since constructed responses to questions concerning actual consumer problems form the basis for a realistic assessment of consumer awareness, the next step was to identify the problems to be included in the TCAA. The researcher compiled a list of 50 current consumer problems based on lists in consumer studies text and reference books; articles in current periodicals and newspapers; feature spots on television; and interviews with consumer advocates. This list was submitted to a national panel of fifteen consumer educators and advocates who ranked the problems

using a Q-sort process. The 30 top-ranked problems were used as the basis for the development of twenty-eight mini-case studies involving one or more of the consumer problems. Three questions, each requiring a short response, were developed for every mini-case. The examinee was asked to (1) list what an individual could read to find out about the problem described in the mini-case; (2) tell how the consumer in the mini-case was protected by the law; and (3) tell what agency the consumer could contact for help in gaining redress. The assumption was made that since the mini-case is a representation (or simulation) of an actual consumer predicament, the questions relating to the situation would elicit responses which closely approximate the respondents' application of knowledge in a similar, real-life situation.

It must be noted that the TCAA is intended to measure awareness rather than actual behavior. Based on the review of related research, assumptions were made that consumers who are aware of available information would be more likely to use that information; that consumers who are aware of laws would attempt to use them to their advantage; and that consumers who are familiar with consumer protection agencies would be likely to utilize their services. It was further assumed that if consumers are unaware of information, laws, or agencies that they will be unable to use them when attempting to solve consumer problems. The validation of these assumptions was beyond the scope of this study.

The original form of the test included twenty-eight mini-cases and required eighty-four responses. Fatigue and hostility were common reactions of respondents after completing the test, so a method of creating a shorter instrument that would yield equally meaningful group scores was sought. Multiple matrix sampling (Sirotnik, 1974) was attempted and proved to be successful. Four subtests, each comprised of seven mini-cases and calling for a total of twenty-one responses, were formed. Statistical analysis using the t-test for correlated means and the Pearson r correlation coefficient indicated that there was no significant difference between mean scores on the complete test and estimated mean scores based on the scores from the subtests.¹

Test Reliability. The reliability of the TCAA was estimated using two different methods. A measure of the internal consistency of the instrument was calculated using a statistical formula which approximates coefficient alpha:

$$\hat{\alpha} = \frac{(M-1) \hat{\sigma}_E^2 - \hat{\sigma}_{EI}^2}{(M-1) \hat{\sigma}_E^2}$$

Where: M = Number of items on the complete test.
 $\hat{\sigma}_E^2$ = Estimated variance of examinee scores.

¹The t-test for correlated means produced a $t = -.82$. With 30 degrees of freedom, $t_{.05} = 2.04$. The correlation coefficient was $r = .90$.

$\hat{\sigma}_{EI}^2$ = Estimated variance for the interaction between examinee and item scores.

The reliability coefficient was .96. The second method used to estimate the reliability of the instrument was the test-retest procedure using alternate sub-test forms. A Pearson r was calculated for two sets of test scores from a group of biology students at Diablo Valley College. This group was used so that learning between the two test administration periods could be controlled. No participants were concurrently enrolled in a consumer studies class. The coefficient was $r = .73$. The two reliability coefficients provided a strong evidence of the reliability of the instrument, sufficiently so to justify its use in the validation studies.

Test Validity. Content validation of the TCAA involved judging the content of the mini-cases and the expected responses for inclusion of: all consumer problems on the master list; available information relevant to the identified problems; and existing channels of recourse which provide assistance in seeking redress. Three consumer educators and two graduate students in consumer studies were asked to judge the content validity of the TCAA. Each assessor was provided with one list of 30 of the most troublesome consumer problems as identified by the Q-sort, a definition of the three elements of consumer awareness, the complete TCAA, and a sample answer key for the TCAA.

There are no numerical formulae which indicate whether or not test content adequately represents the subject matter or situations being measured. The validation process was, therefore, largely subjective. Each assessment of content validity was done independently. Each assessor indicated that the content of the test represented an adequate sampling of the consumer problems, the available information, the existing regulations, and the existing channels of recourse. On the basis of these judgements, the researcher concluded that test scores on the TCAA would have content validity.

The purpose of the construct validation study was to present some evidence of a relationship between scores on the TCAA and some consumer characteristics. Using studies of consumer behavior cited in the literature as a basis, nine research hypotheses were developed to predict relationships between selected socio-economic-educational factors and consumer awareness.

- H₁ The mean consumer awareness scores of adults who have experienced formal classes in consumer education will be significantly higher than the mean scores of adults who have not had such experience.
- H₂ The mean consumer awareness scores of adults will be positively related to the level of attained formal education.
- H₃ The mean consumer awareness scores of adults will be positively related to level of income.
- H₄ The mean consumer awareness scores of

adults engaged in professional and managerial occupations will be significantly higher than the mean scores of adults engaged in other occupations.

- H₅ Adults who have had the experience of filing and processing a formal consumer grievance will have a significantly higher mean consumer awareness scores than adults who have not experienced such process.
- H₆ Adults who are, or have been married will have significantly higher mean consumer awareness scores than adults who have never been married.
- H₇ Mean consumer awareness scores will be positively related to length of time married.
- H₈ Adult women currently participating in the labor force will have significantly higher mean consumer awareness scores than adult women who are housewives.
- H₉ Mean consumer awareness scores of adults will be positively related to the population of their place of residence.

It was necessary to limit the accessible population to the specific geographic area of Northern California for several reasons. First, time and money available to the researcher were limited... Secondly, some consumer information, many consumer protection laws, and most channels of recourse are local in nature. Appropriate TCAA answer keys would have had to have been developed for differing political-geographic areas. By limiting the accessible population to California, sources of information and laws were constant. By further limitation to Northern California, the differences in channels of recourse were minimized. Therefore, the accessible population for the construct validation study was identified as existing groups of adults in Northern California:

1. who were enrolled in adult education, community college, or university classes which were related to some aspect of consumer studies; or
2. who were affiliated with an organization directly involved with consumer problems; or
3. who were affiliated with organizations which have the study or investigation of consumer issues as an objective.

These criteria were established because it was anticipated by the researcher that the TCAA would most likely be used as an evaluative instrument, programming planning tool, or teaching tool by instructors and leaders of groups meeting one or more of the criteria. Furthermore, it was anticipated that including some groups organized for purposes other than formal education would make the sample more representative of the general population and produce greater variability in the socio-economic education factors hypothesized to be related to the construct consumer awareness.

The total sample for the research project consisted of eleven existing groups from Northern California and included a total of 200 participants. The test development study involved 32 respondents from one group, and the construct validation study

involved the remaining 168 respondents from ten groups. Willingness of the group leader/instructor to provide time for the group to take the test was the criterion for participation.

Each participant responded to one of four short forms (sub-tests) of the TCAA which had been generated by the multiple matrix sampling process. Each sub-test required responses to 21 questions. The responses were dichotomously scored: each correct response equals one point, each incorrect response equals zero (21 total points were possible for any one examinee). The mean score for 168 examinees was 6.33, the median score was 6, and the mode was 6. The range was 20, with the low score of 0 recorded for 2 examinees. Ninety-four of the respondents (56%) scored below the mean (6.33). Only 27 respondents (16%) responded correctly to more than half of the questions.

Given the preponderance of low scores, it is not surprising that there were significant differences in mean consumer awareness scores for only four hypothesized factors:

1. Having taken a consumer education class;
2. Level of education attained;
8. Current labor force attachment of women;
9. Population level of place of residence.

H₀¹--There will be no significant difference between mean consumer awareness scores of adults who have experienced formal classes in consumer education and of adults who have not had such experience.

Of the 168 respondents, 147 reported that they had not previously taken a consumer education class and 21 reported that they had previously completed at least one such class. The mean consumer awareness score for those who had not taken a consumer education class was 5.95 and the mean score for those who had taken a class was 8.95. The SPSS program for one-way ANOVA produced a F-ratio of 11.81 with a probability of less than .001. Since probability was less than .05, the null hypothesis was rejected. An Eta² of .066 indicated that 6.6% of the variance in TCAA scores was explained by participation or lack of participation in a consumer education class. Since the null hypothesis was rejected, the research hypothesis was accepted: mean consumer awareness scores of adults who have experienced formal classes in consumer education will be significantly higher than the mean scores of adults who have not had such experience.

H₀²--There will be no significant difference in the mean consumer awareness scores of adults with differing levels of formal education.

Each examinee was assigned to one of five groups on the basis of the level of formal education completed. Those who had completed high school or less (10 examinees) had a mean consumer awareness score of 4.20. Those who had completed some formal education past high school, but had not graduated from college (109 examinees), had a mean score of 6.47. The 36 examinees who held Baccalaureate Degrees had a mean score of 5.86. Those

with Master's Degrees (seven examinees) had a mean score of 10.71; and those with Doctoral Degrees (six examinees) had a mean score of 4.67. The one-way ANOVA resulted in an F-ratio of 3.70 with a probability of .007. Since probability was less than .05, the null hypothesis was rejected. In order to determine which group means were significantly different from one another, Scheffe's test was used. The 10 possible pairs of means were substituted in the formula:

$$F = \frac{(\bar{X}_1 - \bar{X}_2)^2}{MS_W \left(\frac{1}{N_1} + \frac{1}{N_2} \right) (K-1)}$$

The results of Scheffe's test indicated that there was a significant difference ($p < .05$) between the mean consumer awareness scores of adults who had completed high school or less and adults who had completed a Masters' Degree ($F = 3.12$), and between the mean scores of adults who had completed a Bachelor's Degree and adults who had completed a Master's Degree ($F = 2.47$). An Eta^2 of .08 indicated that only 8% of the variance is explained by level of education attained. Since the null hypothesis was rejected, the research hypothesis was accepted: mean consumer awareness scores of adults will be significantly different with differing levels of formal education.

H_0^8 -- There will be no significant difference between the mean consumer awareness scores of women who are currently participating in the labor force and the mean scores of women who are housewives.

There were 129 female respondents: 60 were current participants in the labor force (mean score = 7.08) and 17 were housewives (mean score = 4.65). The 52 women students were not included in this analysis because they were neither current labor force participants nor housewives. The one-way ANOVA produced an F-ratio of 5.52 with an F probability of .03. Since probability was less than .05, the null hypothesis was rejected. An Eta^2 of .069 indicated that 6.9% of the variance in TCAA scores was explained by whether a woman was a current participant in the labor force or a housewife, those working out of the home having a higher score.

H_0^9 -- There will be no significant difference in mean consumer awareness scores of adults residing in towns and cities of different size.

Three types of population centers were established in order to analyze the mean consumer awareness scores by population of the respondent's place of residence. Type I centers included towns with a population of less than 2,500 in geographically remote and/or predominantly rural areas. Type II centers include cities with a population of over 10,000, but are not adjacent to other cities in a major metropolitan area. Type III centers include cities with a population of over 10,000 that are adjacent to other cities in a major metropolitan area.

The mean consumer awareness score for the 26 examinees living in Type I population centers was 5.04. The mean score for the 108 residing in Type II centers was 6.10, and the mean score for the 34 residing in Type III centers was 8.03. The one-way ANOVA produced an F-ratio of 5.18 with a probability of .007. Since probability was less than .05, the null hypothesis was rejected. Scheffe's test was used to determine which group means were significantly different from one another. There was a significant difference ($p < .06$) between the mean consumer awareness scores of adults who reside in Type I centers and the mean scores of adults who reside in Type III centers, and between the mean consumer awareness scores of adults who reside in Type II centers and those who reside in Type III centers. An Eta^2 of .06 indicated that 6% of the variance in TCAA scores was associated with the size of the population center in which respondents reside.

Clearly the factors identified as statistically significant in this study account for only a small portion of the variance in consumer awareness scores, but the results provide some evidence of expected relationships between consumer characteristics and consumer awareness. These statistically significant relationships were used as a basis for constructing two hypothetical consumer profiles:

More aware consumers are likely to be women who are currently participating in the labor force, who have completed a Master's Degree, have taken a consumer education class, and who live in a city with a population of over 10,000 that is adjacent to other cities in a major metropolitan area.

and

Less aware consumers are likely to be housewives who have completed 12 or fewer years of schooling, who have not participated in a consumer education class, and who live in rural or geographically isolated communities of less than 2,500 residents.

Summary and Recommendations

The analysis of the data collected during the study provides evidence that the TCAA scores are reliable and that the test has content and construct validity. The test is unique among available instruments in that it relies on recall rather than recognition to assess consumer awareness. It is assumed that the reliance on recall produces a better estimate of consumer awareness than a test that only requires a respondent to recognize the correct solution to a problem. Furthermore, the results of this study are indicative of a generally low level of consumer awareness for the sample involved.

The content validity of the TCAA was established in a particular time context. That is, the consumer problems included on the test were representative of the most troublesome problems at that time (November, 1977). New problems continually arise, but it is unlikely that many will complete-

ly disappear. Also, the importance of particular problems may vary from community to community.

In order to insure the content validity of the TCAA as used in specific situations, it is recommended that a mini-case "bank" be created. The "bank" would include all current mini-cases used on the TCAA, plus two types of new mini-cases: those written for the other problems on the original list of 50 problems ranked by the panel of experts, and those written as problems are newly identified. The mini-case bank could be used by educators or researchers as a source of mini-cases for constructing tests which would be representative of differing situations.

Given the generally low level of consumer awareness evidenced by this study, it is of increasing importance that researchers and educators continue their efforts to plan, implement, and evaluate consumer awareness. If the current legislative inclination for deregulation and less consumer protection prevails, the need for increased consumer awareness as the first line of defense against consumer problems will become even more important (Swagler, 1979).

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CONSUMER COOPERATIVES: A PERSPECTIVE FOR DEVELOPMENT

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Abstract

The late 1960's and early 1970's were years of re-kindled interest in consumer cooperatives as viable self-help economic institutions. Recent analyses of cooperative development have concluded cooperative growth flows primarily from social and political unrest. However, current cooperative growth can reasonably be linked to other, equally strong currents. Among these are "food politics", a rebirth of consumer action of all kinds, continuing inflation in food prices and a restructuring of the food industry itself.

A consumer cooperative is a business organized and owned by user consumers to provide themselves higher quality goods and services at lower prices. The motive of cooperative production and distribution is service for user-owners, not profit for investors.

Social and Political Unrest

During the 1960's, attempts at organizing new cooperatives grew out of the civil rights movement and the Great Society's War on Poverty. The Economic Opportunity Act of 1964 provided funds for organizing and maintaining both producer and consumer co-ops among low income target populations. (Ulmer, 1969; Marshall and Godwin, 1971). Although nearly all of these government funded cooperatives did not survive, they did put the cooperative idea into wider circulation and brought it extensive publicity. Equally important, poverty program cooperatives served as training grounds for future co-op organizers (as did the Peace Corps in its early days). (The Co-op Handbook Collective, 1975).

By 1968, effects of the war in Viet Nam were being felt in the cooperative movement. As more Americans found themselves engaged in confrontation politics to end the war, it seemed to them the American capitalist system had become morally bankrupt. Many felt the only solution was an immediate decentralization of political and economic power. Cooperatives have come to be considered an important tool with which citizens can regain direct control over their lives. The effect of this desire for a new social and political order on new food co-ops cannot be underestimated. It has determined such fundamental factors as the members they have attracted, the products they have sold, the business practices adopted (and rejected), the methods used to make decisions, the physical appearance of co-op storefronts and the way in which new co-ops have interacted with older, more established co-ops founded during the depression.

The Politics of Food

As the overt consequences of the war have faded from the social arena, other problems and issues have come forth. One of the most pressing of these, the twin realities of over-population and dwindling world resources, has had significant effect on the food co-op movement. Food became one of the major issues of the late 1970's: growing it, processing it, profiting from it, even use of it as a political weapon. Debate over food politics centers on four primary issues: the energy intensive food system, the worldwide growth in demand for food products, the nutritional quality of the American diet and food production and processing methods heavily dependent on fossil fuels.

As they became aware of the issues that have come to be known as the "politics of food", some consumers began to change their eating habits. Consumers who wanted to eat more natural foods were seldom able to find them on the shelves of the local supermarket in the early 1970's. In the best cooperative tradition, as friends and acquaintances realized their shared interest in finding a cheap, reliable source for natural foods, many of them organized cooperatives to meet their needs. As a result, one of the very strong currents of the cooperative movement has been a commitment to provision and sale of natural foods, and, by extension, a refusal to offer highly processed foods for sale.

A Renaissance of Consumerism

Concern for food safety attracted another type of consumer to the cooperative movement: one who joined or started a co-op in answer to a set of needs unrelated to "counter-culture" politics. This current flows from the growing consumer movement of the 1960's and 1970's. (This, of course, is not to suggest that there had not been strong ties between the consumer movement and the cooperative movement prior to the 1960's. Often the line between the two movements has been a very thin one.) The suggestion here is that the growth of consumerism in the last 15 years has been a strong contributor to growth in cooperation. But there is a fundamental political difference between cooperators who came to the movement from an anti-establishment, anti-war, counter-culture perspective and those who came from a consumerist perspective. Counter-culture theorists looked to a future when the capitalist system would be completely restructured, if not overthrown. Consumerists emphasized adapting or transforming the production process so that it would more adequately meet consumers' needs. The fundamental goals of these two groups are quite different and have wrought no small amount of conflict within the cooperative movement. (Kreitner, 1979).

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Food Price Inflation

Pressured by declining real income, many people have organized operatives for a very basic reason: to save money. Over the years studies have repeatedly found that people join food (and other) co-ops because the prices are lower at the co-op than at the local supermarket. As the purchasing power of the dollar declines, savings on foods, as well as other necessities will be more important to consumers. People who are attracted to co-ops because their prices are lower have the potential to broaden the membership base of the cooperative movement. This potential will not be realized, however, if cooperatives are not willing to deal with the issue of food prices.

Many cooperators have voiced the frustrated complaint that "all the members want is cheap food". There has been a strong feeling that people should be willing to join and purchase from a co-op even if the food prices are equal to or higher than other retail alternatives. In essence, members have been expected to be willing to pay more to support the cooperative idea and philosophy; to make a political statement. If these expectations were valid in the 1960's, they are certainly at best unrealistic in the 1970's. Families no longer have the luxury of supporting their political ideals through higher food prices.

If food cooperatives are to meet the real needs of families of the 1980's, they must use innovative methods to provide food at lower prices than other alternatives. If it is more expensive to "shop co-op", survival of the co-op of the 1980's will be seriously threatened. Alternatively, inflation in food prices is making consumers more price-conscious and more willing to join and patronize consumer co-ops. Under these conditions, cooperatives must become aware of the major contributors to rising food prices, isolate those over which they have some control, and implement creative marketing strategies that strike at the escalating cost of food.

Although several studies have verified the significant savings cooperatives can provide for their members, there is, as yet, little systematic analysis of the source of those savings. Clearly, any system that is able to significantly reduce marketing costs will, consequently, reduce the cost of food to the consumer. Several studies give indications of the potential for food co-ops in these areas.

Rising Food Marketing Costs

Because one of the most distinctive features of consumer cooperation is its elimination of profits for outside investors, it is useful to explore the increases in the profit component of the marketing bill in more detail. The majority of food co-ops (both old and new wave) have concentrated their efforts on retail sales. Estimated before-tax profits for the food retailing industry were \$1.68 billion or 1.4 percent of sales during 1976. (Marion, et.al., 1979).

Citing this low profit-to-sales ratio, industry representatives have perennially asserted that food prices cannot be cut more than one or two percent without losses to the industry. Yet this reasoning assumes that food retailers are cost-conscious surveyors of food, that excess costs have been reduced to an absolute minimum. Two types of evidence increasingly suggest that this is not so: the changing structure of the food system and retailer gross margins.

The amount of market power possessed by firms in the food system and, by inference, the divergence of food system performance from consumer preferences has steadily increased during recent decades. Market power is directly related to the selling structure of markets and there is evidence of increasing concentration in food manufacturing and retailing. Seller concentration in most local markets has also increased. The consumer should have little trouble understanding why sellers would expend time and resources to expand their market share and increase market concentration. Economic theory postulates that the existence of monopoly or oligopoly in any industry generates higher profits and will ultimately result in higher prices to consumers.

It is important to note that price overcharges do not result solely from inflated profits. Several studies have found that monopolistic markets are characterized by inflated costs and inefficiencies as well as inflated profits. Recent research by Marion and others (Marion, et. al., 1979) found prices in concentrated food retailing markets increased at a more rapid rate than profits suggesting costs also increase. The research examined the price and profit performance of large food chains in several American urban areas. Whereas profits, for example, were only three percent above competitive levels in monopolistic markets, prices were eight percent higher.

It is extremely difficult to estimate the direct costs to consumers resulting from inflated profits, inflated costs and inefficiencies that appear to be characteristic of monopolistic markets. Several recent studies, however, have made such an attempt for the food industry.

In 1978, Parker and Connor estimated price overcharges in food manufacturing industries. When the costs of imperfect competition were included, consumer losses due to monopoly were estimated to be \$12 to \$14 billion for 1975. This amounts to annual overcharges of more than \$50 per consumer each year, or over \$200 for a family of four.

Using both pricing data and profit-sales ratios of leading chains in metropolitan areas, Marion, et. al., (1979) estimated national monopoly overcharges by the four largest firms in each Standard Metropolitan Statistical Area (SMSA) were \$662 million in 1974.

In a Canadian study, excess capacity alone was estimated to overcharge consumers four cents for each dollar of sales. (Parker, 1976).

Thus studies indicate the existence of both inflated costs and inflated profits in both food manufacturing and food retailing. If cooperatives are able to operate in ways that significantly reduce these costs, they can act as a competitive force to reduce the cost of food to consumers.

However, the outlook for survival of independent food retailers (e.g., cooperatives) is not good. Not only are cooperatives unable to achieve the economies of scale associated with large scale retailing because they do not operate on a regional or national level, they are not able to cover losses or price wars in one metropolitan area with higher than average profits in another area.

Conclusions and Outlook for the 1980's

Analysts of social and political movements of the 1960's and 1970's have assumed that the new wave of cooperation has primarily been due to radical, political action. However, more careful consideration indicates there is no one cause for the renaissance of interest in cooperatives.

In the context of a vital and growing national movement leaders of consumer cooperatives have been called upon to give direction to cooperative development in the coming five, ten or twenty years. In defining priorities it is apparent that cooperative leaders must understand and accept the broad-based nature of the movement both in terms of the variety of people that have become cooperators and the variety of needs that motivated them.

The information presented in this paper suggests several factors to consider in cooperative development during the 1980's. Among these are a changing economic climate, a changing membership base, and a need to emphasize that consumer cooperation is fundamentally an economic act from which social benefits flow.

Increasing concentration in the food industry will intensify the competitive stress on co-ops, particularly large ones. This stress will be especially evident in areas in which competing chains are being subsidized with profits from other areas of the country. It would appear that effective competition from the cooperative sector will require the movement to develop strong federations that can operate producing, purchasing and wholesaling functions at an economically competitive level.

In short, the cooperative sector will need to integrate, both vertically and horizontally.

During the 1960's and 1970's, many new wave co-operators had a strong desire to see the movement disrupt the capitalist status quo in the United States. (Case and Taylor, 1979). They were able to synthesize radical politics and food politics at the local co-op and concentrated their effort on a rather narrow segment of the population; young hip, white radicals. As a result, many new wave

cooperatives have been accused of being steadfastly elitist in an attempt to keep both the politics and the food pure. Changing economic imperatives may very well change the characteristics and needs of the membership base of food co-ops.

An expanded membership will almost certainly have needs different from those of counter-culture activists. For example, it is likely cooperatives will be asked to expand their product lines significantly beyond traditional natural food items. The resilience of the new-wave cooperatives, their ability to adapt to the needs of a broader-based membership, and their willingness to commit resources to member education will determine whether cooperative growth continues through the 1980's.

Cooperative consumers continue to be concerned about the social and political impact of a community-owned, grass-roots managed and directed consumer co-op. Members are conscious not only of how much money they can save. They want to know whether the co-op will support their needs for action on a spectrum of social and economic issues: education, utilities, housing, transportation, legal and health services, and community development. As much as economic competition is necessary to serve the needs of some consumers, socio-political action may be equally necessary to fill the needs of others.

It is at this point that the revolutionary nature of cooperation becomes evident. People start cooperatives when "things are not done well, when needs are not supplied, or when profit businesses are failing". (Warbasse, 1972). They work together to correct these situations. They work not competitively, but cooperatively. Their motive is not to profit, but to serve themselves and each other. They pool their energies to bring about change. They take charge of their lives peacefully and constructively.

Cooperative developers of the 1980's will do well to heed the words of James Peter Warbasse, "The test of radicalism is not in the amount of noise and chaos, but rather in the fundamental quality of the changes it accomplishes." (Ibid, p. 17).

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PARTICIPATORY CONSUMER COOPERATIVES: EVIDENCE ON ECONOMIES OF SIZE
AND PERFORMANCE OF PREORDER FOOD COOPERATIVES

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Abstract²

Preorder consumer food cooperatives, commonly called food buying clubs, are a well known example of participatory consumer cooperation. Members directly contribute time and effort to the group endeavor to receive the cooperative's products and services. This article develops a theory to predict when consumers will join a preorder food cooperative. It also combines previous empirical research with a multiple regression analysis of the relationship among labor efficiency, group size and sales volume to evaluate the economic returns associated with different levels of operation.

Introduction

Cooperative action is a social and economic phenomenon directly associated with the drama of the Industrial Revolution. Diverse groups from social reformers to farmers have organized cooperative ventures for a multitude of reasons during the past two centuries. Most have failed, and the cooperatives that have survived often seem limited in scope when compared to their founder's visions. Yet the cooperative idea continues to reappear, especially during periods of social and economic upheaval. Self-help through mutual aid does not seem to be an outmoded idea.

Participatory consumer cooperatives are organizations in which consumers cannot only contribute capital and patronage, but also labor. Participation is as forthright and uncomplicated as purchasing groceries at wholesale for the cooperative group, or sharing the janitorial duties in a cooperative housing project. It could also be a group of farmers who react to the shrinking farm supply system by jointly purchasing and transporting items from a more distant source.

Curhan (1972, 1975) and Hoyt (1974) have analyzed the organization of preorder consumer food cooperatives and the price savings associated with participation. This paper builds upon their survey research by developing a participatory cooperative theory and testing hypotheses deduced from it concerning the relationship between group size, sales volume, and economic returns to cooperative membership. Empirical results are based upon data collected during 1978 from 21 pre-order consumer food cooperatives in the Midwest.

A Theory of Participatory Cooperation

In constructing a theory of participatory cooperation we will concentrate upon a member's decision to join the group endeavor. As conditions both endogenous and exogenous to the cooperative change,

the number of the members changes. If no one joins, there is no cooperative. This decision-theory approach is more general than those of previous theoreticians who commence their analysis with the project-maximization assumption and the neoclassical theory of the business firm.¹ Cooperatives can exist and benefit their members without maximizing any particular form of return to an individual member. Applying the calculus to joint decision problems in a cooperative requires the analyst to construct a utility function with the different types of benefits as arguments for each member. These individual functions must then be aggregated into a group utility function that can be maximized by the cooperative. The incommensurables surrounding interpersonal utility comparisons make this measurement exercise very difficult and may well distract the analyst from more basic questions concerning cooperative size and growth. What one needs to know is when will a consumer join or exit a cooperative, not when is his/her utility maximized.

The theory developed here is specific to preorder cooperatives which are admittedly a special case because they require little investment in inventory or fixed assets. Thus capital investment aspects can be ignored; only purchase and labor input decisions need to be explained. Generalization is straight forward, requiring only more mathematics and more complex decision rules.

Participating in a preorder food cooperative involves ordering food in advance of delivery, consolidating household orders into a group order, purchasing ordered items in bulk, transporting them to a distribution point, breaking them down into household orders and collecting payment. Members usually supply all the labor needed and coordinate the cooperative activity. When deciding to join a group an individual must determine whether the price savings on his food order is adequate compensation for the time contributed to the co-op. More precisely an individual will join the cooperative if the shadow wage earned by participating is greater than the opportunity cost of time spent at the co-op.

A participant's shadow wage is a function of several factors. Equations one and two can be used to compute a shadow wage.

$$W = \frac{1}{1-t(y)} \frac{S}{H} \quad (1)$$

where

$$S = \frac{D}{1-D} P \quad (2)$$

given:

W = shadow wage (\$/hr.)

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¹See, for Example, Carson (1977)

$t(y)$ = marginal tax rate; a function of nominal income, (y) , and expressed as a decimal
 S = total savings during a given time period (dollars/period)
 H = time contributed during a given time period (hours/period)
 D = price savings expressed as a decimal proportion of supermarket prices
 P = purchases at the co-op in a given time period (\$/period)

The individual's decision criteria can be stated mathematically as follows:

$$\text{Join if: } \frac{DP}{[1-t(y)][1-D]_H} > C(I) \quad 3)$$

where: $C(I)$ = opportunity cost of participation (\$/hr.); an increasing function of real income, I .

Larger values of D , percent savings over retail expressed as a decimal, increase the shadow wage. The percent spread between co-op and supermarket prices depends upon the supermarket price level which in turn is influenced primarily by labor costs and the degree of competition in the retail market. It also may reflect transport savings if the consumer needs to travel to a distant supermarket less often and the co-op's distribution point is nearby, as would be the case in many rural or central city areas. Larger purchase volume, P , also increases the shadow wage to make joining more attractive. Spending more time in cooperative activity (higher values for H) reduces hourly returns ceteris paribus.

Change in nominal income has two components--change in the rate of inflation and change in real income. When nominal increases are due solely to inflation, the marginal tax rate increases, thereby increasing the shadow wage. The opportunity cost of participation, however, remains constant because it is a function of real income. The attractiveness of participation increases. This effect is stronger if inflation not only moves individuals into higher tax brackets but also results in lower real incomes. A change in real income with no inflation (an equal change in nominal income) is the only income effect that has an ambiguous impact upon the participation decision. It increases both the shadow wage and opportunity cost.

A consumer that values cooperation for non-economic reasons may participate when the shadow wage is less than the opportunity cost. This possibility can be accommodated by adding a non-economic value factor (M) to the left hand side of equation 3. The result is:

$$\text{Join if } M + W > C \quad (4)$$

This can be written as:

$$\text{Join if } W > C - M \quad (5)$$

Stronger non-economic considerations have the same analytical effect as lower opportunity costs of participation.

Cooperative size, as measured by the number of households, can be introduced to the decision model by considering its impact upon efficiency. A cooperative is more efficient if it can distribute a given amount of groceries with lower time inputs from its members. Therefore, efficiency is measured by the ratio between time contributed (H) and the amount purchased (P) - the labor input ratio. A lower H/P ratio indicates greater efficiency and produces a higher shadow wage. What we would like to know is how efficient are preorder cooperatives, and are larger units more efficient, as measured by the labor input ratio, than smaller ones?

Empirical Evidence

All of the parameters contained in equations 3-5 are measurable; however, some present a larger challenge to survey research than others. Measuring individuals' valuation of non-economic factors and their opportunity costs is difficult. Krietner (1978, p. 141-142) found that active participants in cooperative stores were individuals who valued the social mission of the cooperative highly; however he did not identify a schedule between non-economic values and participation. Other researchers have concentrated their efforts upon measuring the shadow wage.

Curhan and Wertheim surveyed 24 preorder cooperatives in the Boston area during 1971. Detailed comparisons of cooperative and supermarket retail prices revealed that net savings of about one-third were realized for fresh produce. Savings on all other items was at best 20 percent--less in the instance of meat and more for bakery products, eggs and miscellaneous purchases. They conclude that on the average, consumers save 25 percent by joining preorder cooperatives (Curhan and Wertheim, 1972, p. 34). Curhan and Wertheim also collected data from 225 participants in the cooperatives. They combined information on purchases and time commitments with their evaluation of savings over retail to estimate shadow wages.

"Cooperative leaders reported that member work commitments required an average of three-quarters hour per week, although members reported commitments of one and one-half hours per week. Cooperative shopping exclusive of work commitments, probably required two-thirds per week. The total time commitment for a typical member probably averaged one and three quarters hours per week, although the commitment for members heavily involved in cooperative operation exceeded three hours per week. Assuming average purchases by each group, this translates to savings of \$3.62 per hour for the minimally involved member who did no work, \$1.37 per hour for the typical member and less than \$.80 per hour for involved members (Curhan and Wertheim, 1972, p. 37)."

These estimates are understated because no consideration is given to the marginal tax rate. Moreover shopping time should not be included in the time requirement estimates. The opportunity cost

concept is instructive here. Since consumers are not paid to shop at a supermarket, they should not count time spent shopping at a co-op. We recalculated their estimates for "typical member" without shopping time (.67 hours) and assuming, conservatively, a 15 percent marginal tax rate. This more appropriate calculation increases the shadow wage from \$1.37/hr. to \$2.51/hr. The federal minimum wage in 1971 was \$1.60/hr.

Hoyt evaluated the economic return to participation for members of a large preorder cooperative in Sacramento, California, during 1971. A random sample of 50 members was drawn from the total membership of 366 consumers (Hoyt, 1974, p. 39). Price comparisons on all products purchased were made between the cooperative and the supermarket that respondents indicated as their shopping alternative. Two monthly orders were checked. The average cost of the monthly grocery basket purchased at the cooperative was \$49.55. If purchased from the most likely alternative the same basket would have cost \$63.18. The cooperative saved members, on average, 22 percent (Hoyt, p. 72). Hoyt also found that the magnitude of the price differential was not related to order size. Individuals placing large orders seemed to save, on a percentage basis, about the same as those placing small orders. Sacramento Preorder Cooperative carries a full line of grocery, produce, fresh meat, and household items.

Although Curhan, Wertheim, and Hoyt's research was conducted in 1971, their estimates of percent price savings (D in equation 3) are reasonably accurate indicators of current conditions. The remaining determinants of the shadow wage are the marginal tax rate (t) and the labor input ratio H/P. Tax rates are linked to income levels and exhibit relatively little variation. On the other hand the magnitude of the efficiency ratio can vary considerably and have a significant impact on the shadow wage. A survey of preorder food cooperatives in the midwest conducted during 1978 enables us to measure the efficiency of several cooperatives and evaluate the relationship between co-op size and efficiency.

Fifty-two preorder cooperatives returned the survey, but only 21 provided data suitable for this analysis.¹ An aggregate labor input ratio for each cooperative was constructed that indicates the number of hours required to distribute \$20 of groceries valued at invoice cost. Hours per \$20 is used rather than hours per \$1.00 for convenience. The reported values of the ratio (E) have larger values, ranging approximately between one and ten. The relationship between the cooperative's aggregate shadow wage and the labor input ratio (E) is

$$W = \frac{20D}{(1-D)(1-t)} \frac{1}{E} \quad (6)$$

¹One cooperative that furnished data was not included because it was in transition to a store. Another is not included because with 300 members it is substantially larger than the other cooperatives, that range from 7 to 175 households with all but one less than 101 households.

Where E = hours per \$20 cost of goods sold.¹

Although aggregate performance measures convey little information about the distribution of returns among members in a co-op, they are useful for determining whether a given co-op, on average, outperforms other cooperatives. There are a number of factors that explain the variation in a cooperative's labor input ratio, and in turn the shadow wages earned. Multiple regression analysis can assess the relative importance of some underlying factors, including the number of member households, the cost of goods sold per distribution, the average size of household orders, and the cooperative's product mix.

Number of Households. When the number of households in a pre-order cooperative increases, the amount of time required to coordinate the ordering and distribution process increases. Coordination depends very heavily upon communication among all members of the cooperative. As the number of members increases, the communications network becomes more formal and time consuming. It becomes difficult to obtain agreement. Therefore transactions within larger groups not only take more time, but also may take more time per unit of sales--a diseconomy of size. As the cooperative grows larger and more impersonal, peer group pressure also becomes a less effective control for free riders. More members, perhaps due to frustration and impatience with time consuming group palavers, become lax in their cooperative responsibilities. For these reasons we hypothesize that the number of households is positively related to the labor input ratio, i.e., larger groups require more time per unit of sales.

Cost of Goods Sold per Distribution (CGD.) This variable is calculated from annual costs of goods sold and the number of distributions per year.² It measures a second dimension of size that is indicative of the physical distribution process rather than decision-making. Although preorder cooperatives differ from other retail businesses, including cooperative stores because they have very low investments in fixed plant and equipment, they may still enjoy throughput economies. Handling small volumes of goods is not conducive to specialization or full utilization of volunteer labor. Setup and cleanup tasks can represent significant time costs. Preorder cooperatives handling larger volumes per distribution may allocate these fixed time costs over a larger volume. Therefore increasing cost of goods sold per distribution can be expected to lower the labor input ratio (E) of the cooperative.

Average Order Size (S). The average order size, measured by cost of goods sold per household (CGD/H)

¹See (Cotterill, 1979) for further analysis of the relationship between the shadow wage and the arguments of this function.

²Cost of goods sold is used instead of sales because it is a more accurate indicator of the cooperatives long-run volume. The two measures are nearly identical except for a few preorders that have gross margins above 10 percent to accumulate reserves. Such large margins are probably temporary changes. The correlation between cost of goods sold and sales is .995.

is an alternative measure of physical distribution economies. Average order size is expected to be negatively related to the labor input ratio when introduced in lieu of CGD. Larger orders per household enable a given group of households to allocate fixed time commitments, e.g. set up and clean up, over more grocery sales.

Binary Product Group Variables (P24, P3). Products handled by the cooperative vary in their value and time requirements for distribution. Low cost bulk items requiring repackaging, such as flour and beans, require large inputs of time relative to their value. Products requiring less handling, such as plastic or aluminum wrap, or high value items such as fresh meat may be expected to have a low time input per \$20 of sales. At another point in this research, products were classified into five groups, based upon their handling characteristics. This was done to examine preorder cooperatives' procurement and product line expansion patterns. The subsample of 20 cooperatives currently being analyzed however, only carry products in the first four groups. Product group one contains dry goods such as flour and beans, canned goods and dairy products—mainly cheeses. Group two contains household items, books, and health and beauty aids. Group three has eggs, prebaked goods and fresh produce. Group four has frozen foods and fresh meat. Note that group two and group four contain products that are relatively more expensive or easier to distribute than group 1 products. Therefore, a co-op with products in these groups (P24 = 1) is expected to have a lower labor input ratio (E) than other cooperatives. Group 3 products are more expensive than group 1 products, but their increased value may be cancelled by the increase in time requirements to distribute them. Therefore, it is unclear whether a co-op that carries group 3 products (P3=1) has a higher labor input ratio.

One way to summarize these hypotheses is to present them in algebraic form.

$$E = a_0 + a_1H + a_2(\text{CGD or } S) + a_3P24 + a_4P3 + \epsilon \quad (7)$$

Where: E = the labor input ratio (Hrs/\$20 COGS)
 H = the number of households
 CGD = the cost of goods sold per distribution
 S = average order size
 P24 = binary variable identifying product groups two and four
 P3 = binary variable identifying product group three
 ϵ = the disturbance term

Table 1 presents the statistical results of the multiple regression analysis. Equation one evaluates the linear relationship between the labor input ratio (E) and the number of member households (H). The coefficient for H is positive as hypothesized and statistically significant at the five percent level. The number of households in the sample range from 7 to 175 with all but one co-op falling at or below 100 units.¹ One hundred households require on average two and one half times more labor input from members to distribute groceries. The R² value indicates that the equation explains 35.0 percent of the observed variation in E.

Equation two introduces cost of goods sold per distribution to evaluate the influence of physical distribution economies as well as the coordinating diseconomies measured by H. H becomes more strongly and positively associated with the E ratio; that is co-ops with many members tend to be less efficient as hypothesized. CGD is negatively related to the labor input ratio as hypothesized, and the coefficient is significant at the five percent level. Higher throughput leads to fewer hours per \$20 of

TABLE 1. MULTIPLE REGRESSION EQUATIONS EXPLAINING LABOR EFFICIENCY IN PREORDER CONSUMER FOOD COOPERATIVES^{a/}

Equation	Intercept	Households (H)	Cost of Goods Per Distribution (CGD)	Average Order Size (S)	Product Groups 2 and 4 (P24)	Product Group 3 (P3)	Number of Observations	R ²	F-Ratio
1)	1.43	.0304 (3.20)**					21	.350	10.23**
2)	2.00	.0564 (3.88)**	-.00225 (2.23)*				21	.491	8.67**
3)	2.55	.0258 (2.64)**		-.0441 (1.45)+			21	.418	6.47**
4)	2.02	.0371 (4.10)**			-1.22 (1.65)+	-.0864 (.09)	19	.532	5.69*
5)	2.00	.0537 (3.392)**	-.00181 (1.27)		-.451 (.48)	.0296 (.03)	19	.581	4.84*

^{1/}Significance levels: ** = 1 percent, * = 5 percent, + = 10 percent

¹This relationship remained statistically significant when the equation was rerun after deleting the 175 household observations.

sales. The equation explains 49.1 percent of the variation in E and is significant at the one percent level with an F-ratio of 8.67.

Average order size (S) is introduced in lieu of CGD in equation 3 and performs as hypothesized. It is negatively related to E and significant at the 10 percent level suggestive that larger orders require less time per \$20 of sales. However, average order size is less effective than CGD in distinguishing between decision-making and distribution economies. Not only is the t-value on H lower, the R² is substantially lower as well. The overall model remains significant at the one percent level.

The binary variables P24 and P3 are introduced in equation 4 along with number of households. H remains positively and significantly associated with the labor input rates. Co-ops whose product mix covers groups two and four, the relatively expensive and easy to handle items, have lower E ratios. The relationship is statistically significant at the 10 percent level. The P3 product binary indicating distribution of eggs, baked goods and fresh produce has no significant influence upon the labor input ratio. R² is .501 and the F-ratio is adequate to guarantee overall significance at the five percent level.

The final equation introduces CGD jointly with the product group variables and number of households. Its results are as hypothesized, however, some multicollinearity between CGD and P24 causes each to lose statistical significance. This is to be expected. Other things remaining constant, co-ops carrying goods in groups two and four--high value easy to handle items--would have higher sales per distribution. This model explains 58.1 percent of the variation in E and is significant at the five percent level with an F ratio of 4.84.

Although this analysis rests upon only 21 cooperatives, it does suggest that two dimensions of size--the number of households and sales volume--strongly influence the average efficiency of preorder cooperatives. To interpret further the relative impact of these factors on performance we will use equation 2 of Table 1--the most robust model containing both of these explanatory variables. The size and magnitude of the coefficients in equation 2 indicates that, for a given level of sales (CGD), preorders with more households are less efficient than those with fewer units. Yet one must be careful here, because this equation measures the observed relationship among several cooperatives rather than what occurs when a given cooperative grows. In many instances, sales will go up when new households join the cooperative. To analyze the net influence of expanding a cooperative's membership, it is convenient to rewrite equation 2 of Table 1 making use of the Definition CGD = SH:

$$E = 2.00 + .0564 H - .00225 SH \quad (8)$$

The influence on the labor input ratio of adding new households depends upon the level of average order size (S). The impact of adding new members is as follows:

positive (less efficient) if S is less than \$25

zero (no change) if S equals \$25

Negative (more efficient) if S is greater than \$25.

The explanation for this complex result is straightforward. For order sizes less than \$25 the increased time required for decision making and group coordination are only partially offset by the physical distribution economies due to increased sales; at \$25 the diseconomies and economies exactly offset each other; and for larger average order sizes coordination diseconomies are more than offset by throughput economies.

One should not regard \$25 as a magic number. As food prices rise the switching value will also rise, and the limited sample size suggests that this analysis does more to establish the concept of a switch point than to give a precise estimate of its value.

Figure 1 uses the results of our labor efficiency analysis to determine the average shadow wage enjoyed by households in different sized cooperatives. The general equation for these curves can be obtained by substituting equation 8 into equation 6. Values for all variables other than number of households are held constant at the indicated levels. The most striking fact is the impact of average order size. Curve 1 assumes 20 percent savings over retailing, a 20 percent marginal income tax rate, and an order size of 20 dollars per household. (The average order size in this sample of 21 cooperatives is \$20.42). Since order size is less than \$25, curve 1 has a negative slope. Increasing average order size to \$25 would not only shift curve 1 up, it would also rotate the curve until it is a perfectly flat line at \$3.12/hr. This curve is not drawn in Figure 1. However curve 4 illustrates the impact of increasing order size to \$30; the group size-wage relationship shifts upward and becomes strongly positive.

Curve 2 assesses the sensitivity of shadow wages to changes in the marginal income tax rate. A twenty-five percent increase in the tax rate from t=.2 to t=.25 produces a modest upward shift in the curve. Increasing savings over retail (D) twenty-five percent from .2 to .25 has a stronger impact on the group size-wage relationship, shifting it upward from curve 1 to curve 3. In fact, the impact of a twenty-five percent increase in D from .2 is five times greater than the same percent increase in t from .2.¹

Conclusions

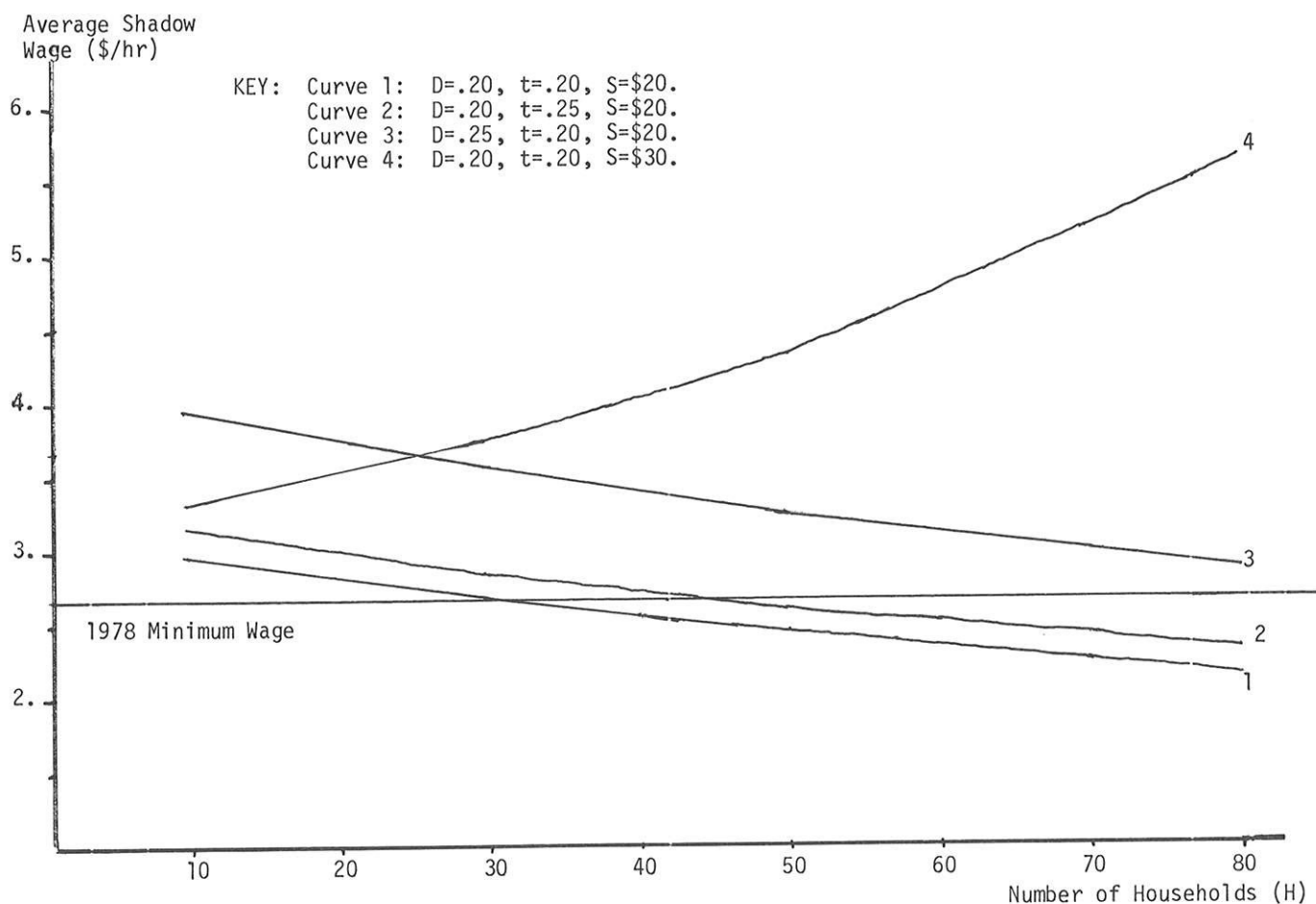
The theory of participatory consumer cooperatives developed in this article provides a framework for

¹The ratio of wage elasticity with respect to D and wage elasticity with respect to t is $\frac{n_D}{n_t} = \frac{1-t}{(1-D)D}$.

Evaluated at t=.2, D=.2 gives

$\frac{n_D}{n_t} = 5$ Ratios of elasticities involving the wage elasticity with respect to changes in S or H are complicated functions of several variables and not easily summarized.

Figure 1. The Relationship Between Number of Households and Average Shadow Wage Given Values for Savings Over Retail (D), the Marginal Income Tax rate (t) and Average Order Size (S)



conducting empirical research. Whether a consumer will join a pre-order food cooperative that requires direct participation depends upon whether the shadow wage earned is greater than the opportunity cost of foregone alternatives. To the extent that non-economic factors enhance the decision to join, they correspond, *ceteris paribus*, to lower opportunity costs.

Empirical research has not completely identified the exact relationships among all of the factors that influence the decision to join a participatory cooperative. For preorder food cooperatives, Curhan and Hoyt have measured the percent price saving accruing to members and calculated shadow wage levels. These efforts, however, did not consider the impact of marginal tax rates or scale of operation. The present study incorporates tax considerations and explores the relationship between the labor input ratio and three measures of cooperative size, the number of households, cost of goods sold per distribution, and average order size. After assuming a marginal tax rate and levels of price saving consistent with Curhan and Hoyt's results, it was possible to analyze the relationship between these measures of size and the average shadow wage enjoyed by co-op members.

Decision-making diseconomies more than offset the physical distribution economies if average order size per household is less than \$25. Therefore larger groups experience lower average shadow wages. If volume per household was above \$25 in this analysis larger cooperatives, as measured by number of households, enjoy higher average shadow wages.

Further empirical research could improve our understanding of participatory consumer cooperatives. For preorder food cooperatives, it would be useful to measure the opportunity cost of different classes of consumers and to evaluate the relationship between opportunity cost and changes in real and nominal income. Estimates of the level and variation in opportunity costs could then be combined with the foregoing research on cooperative labor efficiency and shadow wages to predict more accurately the growth of preorder cooperatives in the food distribution system.

References

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